TEACHERS' PERCEPTION OF BEGINNING AND LONG-SERVING TEACHERS' EFFICACY IN TEACHING MATHEMATICS

ABSTRACT

This paper reports a survey on the perceived success beginning and long-serving teachers in teaching primary mathematics. The results indicate that about 61 per cent of the 78 teachers who participated in the survey perceived beginning teachers as either successful or more successful in handling primary mathematics, while just 47 per cent of teachers perceived long serving teachers as either successful or more successful. A paired t-test carried out yielded a significant difference between the perceived success of beginning and long-serving teachers in teaching primary mathematics, with the former having the higher mean rating of success. It was also found that the majority of beginning teachers preferred to go to other beginning teachers and/or teachers with 4 – 10 years teaching experience when in difficulty in an aspect of mathematics. That is, about 85 per cent and 80 per cent of the teachers who made responses preferred to go to beginning teachers and teacher with 4 – 10 years teaching experience respectively.

The paper argues that the trend could be a probable explanation for the lack of support for newly qualified teachers in Ghanaian schools. The paper in this light concludes by considering how partnership and co-operation between training colleges and schools can help to make teachers, both beginning and long-serving, engage in fruitful professional activities in mathematics to support each other.

Introduction

Knowledge of teachers' perceptions of *beginning* and *long-serving* teachers' efficacy in teaching primary mathematics may provide important information for the improvement of pre-service and in-service teacher education programmes. A number of studies from different countries have examined the perceived problems of beginning teachers. In his review of these studies, Veenman (1984) identified the following as the problems perceived most – classroom discipline, motivating students, dealing with individual differences, assessing students' work, relationship with parents, organisation of class work, insufficient and/or inadequate teaching materials and supplies, and dealing with problems of individual children.

The beginning teacher's efficacy in teaching will depend to a great extent on how well he/she is able to control these problems, and this will depend on the amount of support the teacher is likely to receive from his/her experienced (or long-serving) colleagues. In Ghana, however, the beginning teachers are regarded as *newly trained* and are hardly given any form of professional support when

they commence teaching. This practice provided the spur for this study.

The initial training of primary school teachers in Ghana was done at two levels: the post-middle (or junior-secondary) level, and the post senior-secondary level. The programmes offered at both levels led to equivalent qualifications, that is, *Teacher's Certificate 'A'*. Such programmes have been described as *'secondary level'* initial teacher training programmes (Gimeno and Ibanez, 1981). These were programmes ran in colleges whose curricula, besides curriculum studies (i.e. pedagogy) and education, were identical to the curricula of secondary schools. This implies that teachers' Certificate "A" qualifications are just equivalent to *School Certificate in Secondary Education or GCE 'O" Level.*

Owing to the low qualifications possessed by the majority of teachers in primary schools in Ghana before entering teacher training, the training college mathematics courses they pursued laid emphasis on the development of their academic and intellectual capabilities in mathematics. Professional studies courses which dealt with the theoretical and practical aspects of teaching were not given due attention. It can therefore be argued that at the time of leaving college many Ghanaian primary school teachers have no secure command of the subject matter to be taught and their competence in teaching primary school pupils mathematics is low.

In a recent study, Urevbu (1990) observed a common development that cut across all the curriculum innovations in Africa in the 1960s and 1970s. This was the realisation that many classroom teachers knew little of some of the new ideas and techniques which were put forward in the new curriculum materials introduced into schools. Consequently, the development of materials for both pre-service and in-service education programmes to put teachers in readiness for the innovations, was a major aspect of curriculum projects that were carried out throughout the continent.

In 1973, a new teacher training mathematics curriculum was put on trial in a few colleges. The selected teacher training colleges (six out of the nineteen that existed at that time) were used to trial the new mathematics syllabus and the *Teacher Training Volumes* of the Ghana Mathematics Series textbooks. Following this, new mathematics was first examined in the teacher's final certificate examination conducted by the West African Examination's Council (WAEC) in 1975. Even though the Ghana Mathematics Series textbooks were introduced into primary schools throughout the country also in 1975, it was not until 1985, a decade afterwards, that the content of the mathematics curriculum for all other colleges became "modern". This therefore implies that the majority of

teachers who can be described as *experienced*, at the time this study was conducted (i.e. 1993), are those who studied little or no 'new' or 'modern' mathematics.

In spite of their low qualifications, many teachers after completing their training have not had a workshop, demonstration lesson, or refresher course, organised in mathematics in the places where they teach. Even in places where these have been organised, the courses were not taken seriously by the participants partly because of lack of incentives like payment of travel costs, overnight allowances and expenses on course materials. They were also not taken seriously because several of such courses did not count towards the upgrading or promotion of the teacher (Obeng-Mensah, 1972; Dameh, 1983).

The few of the primary teachers who achieved some development while in service were the ambitious and intellectually capable ones who pursued academic studies. Through private study of academic subjects, these teachers were able to upgrade their general educational qualifications (i.e. obtain General Certificate of Education - ordinary and advanced levels) and entered Universities and Advanced (or University) Colleges of Education. But these teachers do not usually go back to the primary schools after obtaining their diplomas or degrees mainly because their further education courses were not tailored to the needs of pupils at this level. Instead most of them preferred to take up more prestigious teaching appointments in secondary schools and training colleges or were posted there by the Ministry of Education with the explanation that their services were most needed at these levels.

The purpose of the study and the research hypotheses

The background of the nature of teacher education received by teachers in Ghana at the three levels of teacher education, which Landsheere (1987) classified as pre-service education, induction (or probation), and in-service education, raises questions about

- how prepared, and confident, experienced teachers are in taking responsibility of the professional development of their colleagues; and
- the nature of professional support received by beginning teachers.

The objective of the study, in the light of the above questions, was to examine what primary teachers think of the efficacy of beginning and experienced teachers in teaching mathematics. The hypotheses of the study were therefore formulated as follows:

i. The perceived success of beginning teachers in teaching mathematics at the primary level. is not significantly different from that of their long serving colleagues.

ii. The length of teaching experience does not significantly affect the order in which a teacher of an experience group is selected for professional support.

Literature Review

In Ghana, beginning teachers are regarded as *newly trained* and are hardly given any form of professional support when they commence teaching. In discussing this unfortunate development in the nation's teacher education process, Akrofi (1984) rightly pointed out that in Ghana "teacher educators have long deluded themselves into thinking they produce complete teachers. They forget that the teaching process needs both professional and personal competencies which go far beyond the limited college requirement". This development suggests the length of teaching experience has little effect on teacher effectiveness, which contradicts Simmons' (1980: 90-91) assertion that 'the length of teaching experience, does seem to warrant further investigation because, it seems, the more experienced teachers are, the more pupils learn'.

It appears teachers get better during the first few years of their careers but, after this, their effectiveness levels off and probably declines. Ryans (1960) found a rise in effectiveness in the first five years, followed by leveling and a decline. Also Avalos and Haddad (1979) pointed out interestingly in a review that there is an optimum level of experience, between 10 and 20 years, when the effects of experience are more evident. The question of whether experience can influence, in this way, efficacy in teaching all subjects across the school curriculum, requires further investigation. Experienced teachers are more likely to make pupils learn certain subjects 'better' than less experienced ones. This could be due to the former's personal maturation, lessons of experience or to the fact that they have benefited from more training and professional guidance than their beginning counterparts (Dove, 1986).

With regard to the findings of Ryans (1960) and Avalos and Haddad (1979) discussed above, an *experienced teacher* will be taken in this study as one who has taught for at least ten years. Since the effects of experience were observed to be more evident between 10 and 20 years, a teacher with more than 20 years of experience will be designated *long-serving teacher*. Teachers in the first three years of teaching (or the probation years) are *beginning teachers*.

Barnes (1986) observed that a large proportion of studies on teaching experience and teacher

effectiveness used 'student achievement' as a measure of the latter. However, in this study the use of this measure has been completely avoided because other variables (i.e. home and family background variables) have been found to make more significant contribution to student achievement than any school or teacher variables (Mosteller and Moyniham, 1972). The study employed instead, teachers' self-evaluation of their efficacy in teaching the subject. Using teachers' self-evaluation as a proximal measure for determining the quality of teaching has limitations (Lortie, 1975; Jackson, 1968). But Macleod (1988:405) in a recent study on 'Teacher Self-evaluation' concluded that "teachers can and do cope with the task of self-evaluation and do this in ways which serve to reduce the limitations". He argues further that "this is not to assert that there are no difficulties in the process, but it is to assert that teachers recognize these difficulties and take steps to overcome them". These considerations and the fact that Marsh's (1987: 183) teacher self-evaluation studies provide good support for the validity of teachers' ratings of their teaching explain why this approach was adopted for the study.

The Population and Sample

Since the aim, very often, of a survey study is to make generalisation about a relatively large section (or all) of the population, in drawing a sample for a survey, it must be ensured it is, as much as possible, typical of the population. The Winneba District was selected as the source of schools and teachers for this study. The Winneba district was used for this study because it had conditions that made its educational provisions typical of that of the whole country, and offered all the opportunities that were required to carry out a survey of this kind. The district, as shown by the national, regional and district indicators of educational provisions in Table 1, has educational provisions - number of classrooms per school, class-size, school size, and pupil-teacher ratios - which are typical of both regional and national averages.

Table 1 The National, Regional and District rates, ratios and indices of educational provisions

	District rates, ratios and indices	National rates, ratios and indices	Regional rates, ratios and indices
Average number of classrooms per	5.69	5.05	5.47
school	1.01	1.24	1.13
Number. of Classes per classroom	37.10	27.20	30.73
Average size of Class	223.00	173.24	190.10
Average size of School (enrollment)	0.96	1.02	1.09
Average No. of Teachers per class	15.77	33.64	29.75
% of Teachers who are Untrained	38.80	27.09	28.10
No. of Pupils per Teacher	46.50	**	**
% of Teachers who are Female			

[Source: Ghana Ministry of Education and Culture, 1990)

The sample frame for this study, that is, the number of primary teachers in the district over which the results of this study could be generalised, was 379. The sample-size used in the study was 78 that is, about one-fifth of the teachers in the Winneba District were involved in the study. The first four teachers met in all schools visited in the Winneba circuit were made to complete the questionnaire. The respondents were therefore randomly selected. They were made up of 36 and 42 males and females respectively. The distribution of teachers involved in the study by experience can be seen in Table 2.

Table 2 Distribution of teachers by the Experience group of teacher

Experience group of teacher	Frequency	Percent
Beginning teachers	21	26.9
Teacher with 4 - 10 experience	11	14.1
Teacher with 11 - 20	23	29.5
Long Serving teacher experience	20	25.6
Missing (or No Group)	3	3.8
Total	78	100.0

Since the district chosen is typical of districts of the entire country, the results of the study can be taken as a fairly good representation of the nature of support given to beginning teachers the nature of support given to beginning teachers in mathematics teaching in Ghana.

Methodology

The study employed the survey method. The term 'survey' is used in a variety of ways, but commonly refers to the collection of standardised information from a specific population, or some sample from one, usually but not necessarily by means of questionnaire or interview (Robson, 1993). A survey may be used for two major research purposes - descriptive or analytical. In the former type of survey studies, the researcher's aim is mainly to have an accurate description of what people in some target population do and think, and perhaps with what frequencies. In analytic survey studies, on the other hand, hypotheses are formulated, based on the data collected and checked against further information from the same survey. In this study, the survey is largely for the purpose of the former. The major instrument for the study was a questionnaire (see Appendix A). The questionnaire, which was self-administered to teachers, required them to:

- rate the efficacy of BGTs and LSTs in the teaching of primary mathematics;
- indicate the order in which they will choose trained teachers with varying lengths of teaching experience for help when they were uncertain about an aspect of mathematics.

The responses of the teachers were considered in four distinct groups of experience.

The data obtained from the questionnaires were coded and quantified, and then recorded on data summary sheets, following the format required by the Statistical Package for the Social Sciences Extra ($SPSS^X$) computer software - i.e. for windows, described by Norusis (1983, 1991) and Bryman and Cramer (1990). The data were subsequently entered into the computer and the $SPSS^X$ was used in the statistical analysis. The computer package produced a frequency distribution of the results; and also used the one way analysis of variance to test the hypothesis stated above.

Analysis of the Results

The teachers' responses to how they would rate the efficacy of beginning (BGTs) and long serving (LSTs) teachers are summarized in Table 3a and 3b. The Tables show how teachers in the various groups of experience rated BGTs' and LSTs' success in teaching mathematics.

Table 3a Ratings of beginning teachers' success in teaching mathematics.

	Rating of BGT's success in maths teaching			
	slightly successful	not sure	successful	very successful
Experience group of teacher				
Beginning teacher	1	4	10	4
Teacher with 4 - 10 years experience		1	8	1
Teacher with 11 - 20 years experience		3	15	5
Long Serving teacher		1	16	2

Table 3b Ratings of long-serving-teachers' success in teaching mathematics.

	Rating of LST's success in maths teaching			
	slightly successful	not sure	successful	very successful
Experience group of teacher				
Beginning teacher	4	4	7	3
Teacher with 4 - 10 years experience	1	3	5	1
Teacher with 11 - 20 years experience	1	6	14	2
Long Serving teacher		4	13	2

Tables 3a and 3b illustrate differences in the teachers' ratings of BGTs and LSTs' success in teaching the subject. In Table 3a, it will be seen that the greater proportion (i.e. about 61%) of teachers in all four categories of experience perceive BGTs as either successful or more successful in handling primary mathematics, and only about 13% said they were unsuccessful. . The results in Table 3b are however not too different. It will be observed that about 47% of teachers in all four categories of experience perceive LSTs as either successful or more successful in handling primary mathematics. But here as many as 23% said they were unsuccessful. These results also suggest that the longer the teacher remains in service the greater the tendency to perceive the BGT as efficacious.

A paired t-test on the perceived success of BGTs and LSTs was carried out to test the null hypotheses that "the perceived success of beginning teachers in teaching mathematics at the primary level. is not significantly different from that of their long serving colleagues". The result of the test is presented in Table 4.

Table 4 t-tests for Paired Samples - BGTs and LSTs perceived success in teaching mathematics

Variable	Number of pairs	Corr	2-tail Sig	Mean	SD	SE of Mean
RATE_BGT	Rating of BGT's success in m			4.0137	.589	.069
	73	.131	.271			
RATE_LST	Rating of LST's success in m			3.6986	.776	.091

Paired Differences Mean	SD	SE of Mean	t-value	df	2-tail Sig
.3151	.911	.107	2.95	72	.004
95% CI (.103, .528)					

It will be seen that BGTs had average rating of 4.0137 while the LSTs had an average of 3.6986. On the average, the BGTs had 0.32 higher rating than their long serving colleagues. The standard deviation of the 73 differences is 0.911. The standard error of the mean difference is 0.109. The t-value obtained is 2.95, at 72 degrees of freedom. This yielded a probability of 0.004 of obtaining a difference as large as 0.911 in a sample of 73 pairs taken from a population in which there is no difference. Since this probability, the observed significant level, is very small, the null hypothesis is rejected. The test therefore supports the alternative hypothesis that the perceived success of BGTs and LSTs in teaching mathematics at the primary level is different.

The responses to the question of whether or not the BGTs required the professional support of their more experienced colleagues were also analysed. A *oneway* analysis of variance test carried out to test the null hypotheses that "the length of teaching experience does not significantly affect the order in which a teacher of an experience group is selected for professional support" yielded no significant results. The implication being that the teacher's choice of who would provide him/her with professional support was not influenced by teaching experience. However close look at the distribution of the responses revealed more intriguing results. Tables 5 a, b, c, and d present the summary to the responses to the item *on the order in which teachers will choose trained teachers with varying lengths of teaching experience for help* when they were uncertain about an aspect of mathematics. -

Table 5a Order of selecting a Beginning teacher by Experience group of teacher

Order of selecting beginning teacher

	first choice	second choice	third choice	fourth choice
Experience group of teacher				
Beginning teacher	12	4		2
Teacher with 4 - 10 years experience	4	4		2
Teacher with 11 - 20 years experience	13	4	2	2
Long Serving teacher	13	3		2

Table 5b Order of selecting 4 – 10 years experienced teacher by Experience group of teacher

	Order of selecting a 4 - 10 years experienced teacher			
	first choice	second choice	third choice	fourth choice
Experience group of teacher				
Beginning teacher	6	9	2	1
Teacher with 4 - 10 years experienc	4	2	2	
Teacher with 11 - 20 years experienc	4	14	2	1
Long Serving teacher	3	7	3	

Table 5c Order of selecting 11 – 20 years experienced teacher by Experience group of teacher

	Order of selecting 11 - 20 years experienced teacher		
	first choice	second choice	third choice
Experience group of teacher			
Beginning teacher		3	13
Teacher with 4 - 10 years experienc		2	6
Teacher with 11 - 20 years experienc	4	1	17
Long Serving teacher		3	10

Table 5d Order of selecting a Long serving teacher by Experience group of teacher

	Order of selecting long serving teachers		
	first choice	second choice	fourth choice
Experience group of teacher			
Beginning teacher	2	1	14
Teacher with 4 - 10 years experienc	1		7
Teacher with 11 - 20 years experienc	2	2	16
Long Serving teacher	3		9

The Tables indicate that the majority of teachers would like to go to BGTs for explanation on aspects of the subject they find difficult to teach. Thus about 85 per cent and 80 per cent of the teachers who made responses preferred to go to beginning teachers and teacher with 4 – 10 years teaching experience respectively. Only about 10 per cent preferred long serving teachers, while 22 per cent preferred and teacher with 11 – 20 years teaching experience for professional support.

Discussion of the results

The trend where experienced teachers regard the beginning teacher as more, or equally, successful in teaching mathematics, can in the first place be explained in terms of the length and level of the teachers' general education. The majority of teachers with more than ten years teaching experience currently in primary schools are holders of Teachers Certificate 'A'. This implies that the initial teacher training programmes that most of them undertook were those that Gimeno and Ibanez (*opcit*) described as equivalent to upper (or senior) secondary level education. On the other hand, the larger proportion of the less experienced (i.e. not more than 10 years) teachers had post-secondary level teacher training. Most of the less experienced teachers are therefore more qualified academically in the subject than their more experienced counterparts.

Secondly, the changes that occurred in the school mathematics curriculum in the last two decades also complicated the trend. Since the 'new maths' was introduced into schools in 1971, there have been several changes in the content, aims and approach of school mathematics. Yet primary teachers have received very little in terms of in-service education and training in the subject. In the

light of the lack of in-service support the LSTs, who did not do the new mathematics during their general education and training, find it difficult to cope with the teaching demands of the subject. They rely heavily on the teacher's guides and syllabuses. Their poor theoretical knowledge of the new mathematical content makes them feel BGTs are successful or more successful in teaching the subject. Owing to this, the beginning (or 'fresh-from-college') teacher hardly receives any form of professional support from their experienced colleagues in the teaching of the subject. The major concern of this paper is, in fact, to draw attention to this unfortunate development.

The fact that their acquisition of theoretical knowledge of the subject is recent does not necessarily mean BGTs have adequate mastery over the content and pedagogy of the subject. They lack professional practical knowledge, that is, knowledge about teachers' activities and professional life at school (Bromme and Brophy, 1986). It includes knowledge about

- how to teach mathematics to particular types of pupils in a particular type of school;
- testing and assessing pupils' mathematical attainment, .
- classroom discipline,
- motivating students,
- relationship with parents,
- organisation of class work, and
- how to overcome the problem of insufficient and/or inadequate teaching materials and supplies.

Even though they might have been exposed to aspects of such knowledge in their mathematics methodology lessons in college, BGTs have had little opportunity to experiment or trial it. They have hardly planned schemes of work, designed exercises and used it to diagnose learning difficulties, kept records on pupils' assessments, etc. Certain aspects of this knowledge, however, cannot be found in texts. They can only be communicated orally by experienced colleagues. An experienced teacher may tell a BGT how many pupils in his/her class can say the 3 times table or do not understand the concept of place value.

The absence of planned professional support makes BGTs full of ambition on entering the profession, no sooner or later begin to face difficulties in the preparation and teaching of primary mathematics. Under these circumstances, Akrofi (1985:20) stated that the 'teachers will revert to 'safe' and tried methods when experiencing difficulty'. 'The teacher,' he stated further, 'tends to revert to the styles that they "learned" in their long "informal" training as pupils at school'.

In spite of the fact that many experienced teachers have reverted to the use of safe methods they have a lot to offer GBTs in terms of professional practical knowledge. The trend must be broken and BGTs should be made to understand their needs in this perspective. Experienced teachers should also be educated to identify the unlimited professional practical knowledge they can share with BGTs.

Implications for partnership between training colleges and schools

The role that initial teacher training colleges can play in reverting this serious trend to enable BGTs to obtain their experienced colleagues' professional support, cannot be over-emphasized. Teacher trainers and trainees should be made aware of the fact that the 12 to 16 weeks of interns the latter experience as part of their training, cannot equip them with all the professional practical knowledge needed to teach effectively. It is therefore not enough for colleges to continue with the current practice of almost ignoring class teachers in schools where teacher trainees have their practice.

Class teachers should not remain passive observers of 'young fresh-teachers' with "modern" educational ideas. They should have more responsibility in the trainees' practice than simply completing evaluation forms on the trainees at the end of the practice period. In this perspective, there is the need for involvement of schools in the training of teachers in initial teacher training colleges. Teacher training should be seen as the joint responsibility of both practicing teachers in schools and teacher trainers in colleges. The two institutions have to work as partners. They have to cooperate as professionals in partnership. This has been so because, as Alhassan (1994) rightly puts it, "education is a cooperative enterprise in which all hands must be on deck towards the realisation of societal goals".

When there is organized partnership, BGTs will no longer think that because they have knowledge of recent educational theory and practice, they are better than LSTs. It will make the latter feel free to approach their experienced colleagues for professional support and also find opportunities to share new content and approaches they have leant in college with them. On the other hand, LSTs will recognise the professional practical needs of BGTs and sympathise with them. Finally, partnership will build in experienced teachers the confidence they need to provide BGTs with professional support in the subject. It is only with partnership and cooperation between schools and colleges that teachers, both beginning and experienced, will be prepared to share their knowledge and,

in so doing, make teacher education a life-long process.

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